

## PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

| Applicant's or agent's file reference | FOR FURTHER ACTION                         | See Form PCT/IPEA/416          |
|---------------------------------------|--|--------------------------------|
| 206,427-PCT                           |  |                                |
| International application No.         | International filing date (day/month/year) | Priority date (day/month/year) |
| PCT/US04/10177                        | 30 March 2004 (30.03.2004)                 | 31 March 2003 (31.03.2003)     |

International Patent Classification (IPC) or national classification and IPC

IPC(7): B67C 003/28; G01F023/04; G01K003/14 and US Cl.: 374/116, 140, 166, 178, 179, 185; 141/198; 73/295

Applicant

SAUDI ARABIAN OIL COMPANY

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

3. This report is also accompanied by ANNEXES, comprising:

a.  (sent to the applicant and to the International Bureau) a total of \_\_\_ sheets, as follows:

sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).

sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.

b.  (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

|                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input type="checkbox"/>            | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

|  |   |
|--|---|
| Date of submission of the demand   | Date of completion of this report                                   |
| 08 October 2004 (08.10.2004)   | 25 February 2005 (25.02.2005)                                       |
| Name and mailing address of the IPEA/ US<br>Mail Stop PCT, Attn: IPEA/US<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, Virginia 22313-1450<br>Facsimile No. (703) 305-3230 | Authorized officer<br>Gail Verbitsky<br>Telephone No. (571)272-2253 |

Form PCT/IPEA/409 (cover sheet)(January 2004)

DEBORAH A. THOMAS  
PARALEGAL SPECIALIST  
GROUP 1900  
*[Signature]*

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**Box No. I Basis of the report**

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on translations from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:

- international search (under Rules 12.3 and 23.1(b))
- publication of the international application (under Rule 12.4)
- international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

the international application as originally filed/furnished

the description:

pages 1-20 as originally filed/furnished

pages\* NONE received by this Authority on \_\_\_\_\_

pages\* NONE received by this Authority on \_\_\_\_\_

the claims:

pages 21-26 as originally filed/furnished

pages\* NONE as amended (together with any statement) under Article 19

pages\* NONE received by this Authority on \_\_\_\_\_

pages\* NONE received by this Authority on \_\_\_\_\_

the drawings:

pages 1/8-8/8 as originally filed/furnished

pages\* NONE received by this Authority on \_\_\_\_\_

pages\* NONE received by this Authority on \_\_\_\_\_

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3.  The amendments have resulted in the cancellation of:

the description, pages \_\_\_\_\_

the claims, Nos. \_\_\_\_\_

the drawings, sheets/figs \_\_\_\_\_

the sequence listing (*specify*): \_\_\_\_\_

any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

the description, pages \_\_\_\_\_

the claims, Nos. \_\_\_\_\_

the drawings, sheets/figs \_\_\_\_\_

the sequence listing (*specify*): \_\_\_\_\_

any table(s) related to the sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**International application No.  
PCT/US04/10177**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)      Claims 4-6,8-23      YES  
                      Claims 1-4,7      NO

Inventive Step (IS)      Claims NONE      YES  
                      Claims 1-23      NO

Industrial Applicability (IA)      Claims 1-23      YES  
                      Claims NONE      NO

**2. Citations and Explanations (Rule 70.7)**

Please See Continuation Sheet

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**International application No.  
PCT/US04/10177**Supplemental Box****In case the space in any of the preceding boxes is not sufficient.****Continuation of:****V. 2. Citations and Explanations:**

Claims 1-4 and 7 lack novelty under PCT Article 33(2) as being anticipated by US 6,202,485 B1 (KEMP) 20 March 2001 (20.03.2001). Regarding Claims 1-4 and 7: KEMP discloses a thermal probe 20 for use in detecting temperatures at different levels in a liquid material, comprising: an elongated rod 21 having a proximal end (22) and a distal end (25, wherein the distal end of the rod is tapered as claimed by Applicant in Claim 4), the distal end making initial contact with the liquid material (L; see Fig. 6; Col. 3, Lines 36-52); a plurality of temperature-sensing junctions (TC1, TC2, TC3, TC4; and each of the junctions includes a thermocouple as claimed by Applicant in Claim 7) positioned along the longitudinal length (Col. 4, Lines 61-64; Col. 5, Lines 9-14; Fig. 5) of the rod, wherein each of the plurality of temperature-sensing junctions generates an electrical signal corresponding to the temperature of the liquid material contacting the respective junction; a plurality of electrical signal conveying members (conductors 50) which are wires as claimed by Applicant in Claim 2, connected to the plurality of temperature-sensing junctions and extending to the proximal end of the rod for conducting the electrical signals and conductive means (Col. 4, Lines 47-60) for conveying the electrical signals from the proximal end of the rod to a remote signal processor 61. KEMP further discloses the rod is comprised of insulating material (mineral insulation; Col. 4, Lines 51-53) as claimed by Applicant in Claim 3.

Claims 5-6 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied in the preceding paragraph and further in view of US 6,098,457 (POOLE) 8 August 2000 (08.08.2000). KEMP discloses a thermal probe for use in detecting temperatures at different levels in a liquid material as described above regarding Claims 1-4 and 7, and further discloses the probe comprising a sheath composed of stainless steel as claimed by Applicant in Claims 5-6, except that KEMP does not disclose a plurality of apertures through an outer surface of the sheath and extending along the longitudinal length of the rod through which the plurality of junctions are respectively exposed to the liquid material as claimed by Applicant in Claim 5. POOLE discloses a thermal probe for use in detecting temperatures at different levels in a liquid material and includes a plurality of apertures (openings) for providing fluid communication between the interior and exterior of the probe (housing). Therefore, it would have been obvious to include apertures in the probe of KEMP as taught by POOLE in order to provide fluid communication between the interior and exterior of the probe.

Claims 8-9 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied in the preceding paragraph and further in view of US 5,178,009 (Arekapudi et al., hereinafter AREKAPUDI) 12 January 1993 (12.01.1993). KEMP discloses a thermal probe for use in detecting temperatures at different levels in a liquid material as described above regarding Claims 1-4 and 7, and the probe includes a plurality of temperature-sensing junctions (TC1, TC2, TC3, TC4; and each of the junctions includes a thermocouple as described above regarding Claim 7, but KEMP does not disclose each of the junctions includes a transistor as claimed by Applicant in Claim 8, and KEMP does not disclose each of the junctions includes a resistance temperature detector as

**Supplemental Box**

claimed by Applicant in Claim 9. AREKAPUDI teaches that a thermocouple and a resistance temperature detector (RTD) are art recognized equivalent temperature sensors in the field of liquid level control. Transistors are also well known equivalent temperature sensors. Therefore, it would have been obvious to substitute a resistance temperature detector (RTD) or a transistor temperature detector for the thermocouple temperature sensor used in the probe of KEMP as taught or suggested by AREKAPUDI in order to measure the temperature of the probe.

Claims 10-13 and 16-23 lack an inventive step under PCT Article 33(3) as being obvious over US 4,915,145 (SCHIRMACHER) 10 April 1990 (10.04.1990) in view of KEMP. SCHIRMACHER discloses a loading system and method controlling liquid material into a container including a probe and rod sensing the level of liquid, the connecting line considered a "loading arm" which extends from the source of material to introduce the material into the container, the probe is attached to the arm; the liquid being introduced through a shut-off valve 10; and a programmed processor 24 responsive to signals from the level indicator to shut the valve in order to stop the flow of liquid to the container when the stop condition is sensed. The loading system is disclosed as being capable of use for loading tank trucks (Col. 1), so it would not be inventive to adapt the system and method for loading sulfur into tank trucks as claimed by Applicant in Claims 11 and 21. KEMP discloses a thermal probe 20 for use in detecting temperatures at different levels in a liquid material, including an elongated rod 21 which is inserted vertically into the material (L; see Fig. 6; Col. 3, Lines 36-52); a plurality of temperature-sensing junctions (TC1, TC2, TC3, TC4; and each of the junctions includes a thermocouple as claimed by Applicant in Claim 13) positioned along the longitudinal length (Col. 4, Lines 61-64; Col. 5, Lines 9-14; Fig. 5) of the rod, wherein each of the plurality of temperature-sensing junctions generates an electrical signal corresponding to the temperature of the liquid material contacting the respective junction. The particular conditions triggering shutting off the valve, as claimed in Claims 16-18 and 22 would have been obvious in view of the method described by KEMP, since KEMP recognizes the temperature of the molten liquid is higher than the temperature of the vapor.

Claims 14-15 lack an inventive step under PCT Article 33(3) as being obvious over the prior art as applied in the immediately preceding paragraph and further in view of AREKAPUDI. SCHIRMACHER and KEMP disclose or suggest a system and method including use of a thermal probe for use in detecting temperatures at different levels in a liquid material as described above regarding Claims 10-13 and 16-23, and the probe disclosed by KEMP includes a plurality of temperature-sensing junctions (TC1, TC2, TC3, TC4; and each of the junctions includes a thermocouple as described above regarding Claim 13, but KEMP does not disclose each of the junctions includes a transistor as claimed by Applicant in Claim 14, and KEMP does not disclose each of the junctions includes a resistance temperature detector as claimed by Applicant in Claim 15. AREKAPUDI teaches that a thermocouple and a resistance temperature detector (RTD) are art recognized equivalent temperature sensors in the field of liquid level control. Transistors are also well known equivalent temperature sensors. Therefore, it would have been obvious to substitute a resistance temperature detector (RTD) or a transistor temperature detector for the thermocouple temperature sensor used in the probe of KEMP as taught or suggested by AREKAPUDI in order to measure the temperature of the probe.

Claims 1-23 meet the criteria set out in PCT Article 33(4), and thus meet industrial applicability because the subject matter claimed can be made or used in industry.